REMARKS

Claims 1-15 are pending in this application. By this Amendment, Figs. 24-26 and 31 have been amended. Reconsideration in view of the foregoing amendments and following remarks is respectfully requested.

Applicant appreciates the Office Action's indication that claims 2, 3, 7 and 8 contain allowable subject matter. However, for the reasons discussed herein, Applicant submits that all of claims 1-15 are in condition for allowance.

I. Formal Matters Satisfied

The Office Action objects to Figs. 1, 24-26 and 31 for failing to contain a legend such as prior art. Regarding Fig. 1, Applicant respectfully submits that the figure illustrates the electrical construction of a display device according to one embodiment of this invention, rather than prior art. Regarding Figs. 24-26 and 31, Applicant has amended the figures to include a "related art" legend. Therefore, Applicant respectfully requests that the objection to the drawing figures be withdrawn.

The Office Action objects to the specification on page 12, paragraph 34 for describing elements not shown in Fig. 1. Applicant respectfully submits that elements 212 and 312 are clearly shown in Fig. 1 inside the liquid crystal panel 100 as the Y-direction scanning lines and X-direction data lines respectively. Therefore, Applicant respectfully requests that the objection to the specification be withdrawn.

II. Claims 1-15 Define Patentable Subject Matter

The Office Action rejects claims 1, 4, 6, 9, 11 and 15 under 35 U.S.C. §103(a) over U.S. Patent 5,867,140 to Rader, in view of the allegedly admitted prior art described in the specification of this application. Applicant respectfully traverses the rejection.

In particular, Applicant respectfully submits that the combination of applied references fails to suggest or disclose a driving method of a display device for driving pixels

which are arranged at each of intersections of a plurality of scanning lines and a plurality of data lines comprising, setting a pixel at each of intersections of particular ones of the plurality of scanning lines and particular ones of the plurality of data lines to be in a display state, while the remaining pixels are set to be in a non-display state, selecting particular scanning lines, one line for every horizontal scanning period with a selection voltage supplied to the selected scanning line for one of two split halves of the one horizontal scanning period, the polarity of the selection voltage being inverted with respect to an intermediate value every two or more horizontal scanning periods, supplying each of the scanning lines other than the particular scanning lines with a non-selection voltage which is inverted in polarity with respect to the intermediate value every one or more vertical scanning periods, supplying each of the particular data lines with a lighting voltage in accordance with content to be displayed on a pixel at an intersection of the selected scanning line and the particular data line for a period during which the selection voltage is supplied to the selected scanning within one horizontal scanning period for selecting one of the particular scanning lines, the particular data line being supplied with the lighting voltage and the non-lighting voltage for substantially equal periods within the one horizontal scanning period for the selected scanning line, and supplying the data line other than the particular data line with the non-lighting voltage for a period during which the scanning lines are consecutively selected in response to the polarity of the selection voltage supplied to the selected scanning lines, wherein the polarity of the non-lighting voltage is inverted in synchronization with the period of polarity inversion of the selection voltage, as recited in independent claim 1, and similarly recited in independent claims 6 and 11.

Rader instead teaches a display system which is capable of switching between a partial display mode and a full display mode, wherein the partial display mode provides power savings over the full display mode. In Rader, when the device is operating in the

partial image display mode, the input switch 414 is held in position B, and the input contact 428 is connected to the output 430. This allows the contents of the FIFO memory 416 to circulate while the DMA channel 406, and optionally the display image buffer 304, are disabled or powered down. This partial display mode eliminates the necessity to operate the DMA channel 406 and the need for repeated DMA access to the large display image buffer 304. The input switch is moved from the input contact 426 to input contact 428 when the first pixel of the first row to be displayed in the top of partial display region 305 is at the output of FIFO memory 416. However, nowhere in Rader is there suggestion or disclosure that the polarity of the selection voltage is inverted with respect to an intermediate value applied to the data line every two or more horizontal scanning periods as alleged by the Office Action.

The allegedly admitted prior art referring to a conventional four-value driving method, teaches that as the scanning signal Y suggests, a selection voltage $+V_S$ is supplied for one horizontal scanning period 1H, and then a non-selection voltage $+V_D/2$ is supplied and held for a whole period. After one vertical scanning period, 1V has elapsed from a preceding selection, a selection voltage $-V_S$ is applied at a non-selection voltage $-V_D/2$ is supplied and held for a whole period. This series of steps is repeated while one of the voltages $\pm V_D/2$ is supplied as the data signal Xi. When a selection voltage of $+V_S$ as a scanning signal Yj is applied to one scanning line, the selection voltage $-V_S$ as a scanning signal Yj+1 is applied to the next scanning line. In this way, the polarity of the selection voltage is inverted every horizontal scanning period. See page 16, paragraph 52 of the specification. However, in this four-value driving method, cross-talk can occur in an area of the display screen when the switching periods of the voltages $\pm V_D/2$ of the data signal is supplied to the data line in the area which coincides with the inversion period of the scanning signal. The selection voltages

on the mutually adjacent scanning lines are opposite to each other in polarity. As a result, a density difference takes place between pixels on the odd row and the pixel on the even row.

A solution to this problem is further suggested in the specification at paragraph 56. This solution divides one horizontal scanning period 1H into a first half and a second half. The selection voltage is supplied to the scanning line for the second half 1/2H, while the ratio of applying the voltage $-V_D/2$ and the voltage $+V_D/2$ to the data signal during one horizontal scanning period 1H is set to be 50%. In this improved four-value driving method, each of the application periods of the voltage $-V_D/2$, and $+V_D/2$ is half the one horizontal scanning period in the data signal Xi if any pattern is presented. Accordingly, cross-talk is prevented. However, as discussed in paragraph 60, in this improved method, the pixel capacitor C_{LC} in the non-display area is subject to frequent charging and discharging for a duration during which a scanning line 312 in a display area is selected. Power consumption is thus not reduced. For example, as shown in Fig. 27, when the non-selection voltage of the scanning signal Yj to the scanning line 312 belonging to the display area is kept to $+V_D/2$, the data signal Xi to the data line 212 assigned to the non-display area corresponds to an off display and the data signal is alternately switched between the voltage $-V_D/2$ and the voltage $+V_D/2$ every half the horizontal scanning period 1H. The pixel capacitor C_{LC} is charged and discharged twice per horizontal scanning period 1H. Moreover, this method requires the generation and selection of the zero voltage in addition to voltages $\pm V_S$ and $\pm V_D/2$, thus making the construction of the driving voltage generator circuit more complex.

To overcome these deficiencies of the conventional four-value driving method, this invention selects the scanning lines one by one and supplies the selected scanning line with the scanning signal containing the selection voltage when the selected scanning line falls within the display area and selects the scanning line with a non-selection voltage when the selected scanning line falls within the non-display area. The polarity of the scanning signal is

inverted every one or more vertical scanning period. Secondly, for the duration during which the scanning line falls within the selected display area, the polarity inversion period of the selection voltage is set to be two or more horizontal scanning periods. The data signal supplied to the data line 212 within the non-display area is fixed to a voltage corresponding to an off display throughout one horizontal scanning period to reduce the voltage switching frequency of the data signal for the non-display area. Third, for the duration during which the scanning line falling within non-display area is selected, the polarity of the data signal for the data line within the non-display area is switched for a predetermined period so the power consumed by the pixels within the non-display area is reduced.

The combination of Rader and the allegedly admitted prior art is incapable of achieving these benefits of reduced circuit complexity and reduced power consumption. Therefore, Applicant respectfully submits that claims 1, 6 and 11 are patentable over the combination of applied references. Moreover, dependent claims 4, 9 and 15 are also patentable over the combination of applied references for at least the same reasons as claims 1, 6 and 11. Therefore, Applicant respectfully requests that the rejection of claims 1, 4, 6, 9, 11 and 15 under 35 U.S.C. §103(a) be withdrawn.

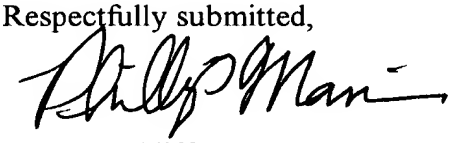
The Office Action rejects claims 5 and 10 under 35 U.S.C. §103(a) over the above references, and further in view of U.S. Patent No. 6,181,313 to Yokota et al.; and claims 12-14 under 35 U.S.C. §103(a) over Rader in view of the allegedly admitted prior art, and further in view of U.S. Patent 6,512,506 to Shimada. Applicant respectfully submits that Yokota et al. and Shimada fail to supply deficiencies of Rader and the allegedly admitted prior art with respect to independent claims 1, 6 and 11 as discussed above. Therefore, Applicant submits that claims 5, 10 and 12-14 are patentable over the combination of applied references and respectfully requests that the rejections under 35 U.S.C. §103(a) be withdrawn.

III. Conclusion

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1-15 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



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JAO:PDM/ccs

Attachment:
Replacement Sheets

Date: August 5, 2003

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